C6. CHAPTER 6
ELECTRICAL STANDARDS

C6.1. GENERAL

This chapter establishes safety standards for the design and installation of electrical equipment and wiring for explosives environments.

C6.1.1. For this purpose, the Department of Defense adopts Article 500 of the Code "Hazardous (Classified) Locations" of the National Fire Protection Association (NFPA) 70 (Reference (l)) (a.k.a., National Electrical Code (NEC)). This Code establishes standards for the design and installation of electrical equipment and wiring for atmospheres containing combustible dusts, flammable vapors or gasses that are comparably hazardous.

C6.1.2. This chapter does not address extraordinarily hazardous situations (e.g., nitroglycerin manufacturing) that will require special consideration and design features. In these situations, the DoD Components shall develop site-specific design criteria.

C6.2. HAZARDOUS LOCATIONS

NEC definitions of Class I, Division 1 and Class II, Division 1 hazardous locations are modified as follows for DoD explosives applications:

C6.2.1. Areas containing explosives dusts or explosives that may through handling produce dust capable of being dispersed in the atmosphere shall be regarded as Class II, Division 1.

C6.2.2. Areas in which explosives sublimation or condensation may occur shall be regarded as both Class I, Division 1 and Class II, Division 1.

C6.3. SPECIAL OCCUPANCIES

To ensure assignment to the proper hazardous location, class, and group, it is necessary to have knowledge of the properties of explosives involved. Minimum requirements include sensitivity to heat and spark and thermal stability.

C6.3.1. If the properties of an explosive are such that Class I or Class II, or both, provide inadequate protection under prevailing conditions, use of any of the following approaches is acceptable:

C6.3.1.1. Intrinsically safe equipment.

C6.3.1.2. Purged or pressurized and suitably temperature-limited equipment.

C6.3.1.3. Exclusion of electrical equipment from the hazardous atmosphere.

C6.3.1.4. Isolation of equipment from the hazardous atmosphere by means of dust, vapor, or gas-free enclosures with surface temperatures positively maintained at safe levels.

C6.3.2. Underground Storage Facilities. All wiring and electrical equipment in underground storage facilities shall, in addition to any other requirements of this chapter, be of moisture and corrosion-resistant materials and construction unless a site-specific analysis indicates that such construction is not necessary. Underground facilities shall have emergency lighting systems to provide minimum illumination in the event of a power failure.

C6.4. STATIC ELECTRICITY

Personnel and equipment in hazardous locations (section C6.2.) and locations where static sensitive Electro-Explosive Device (EED) are exposed shall be grounded in a manner that effectively discharges static electricity and prevents static electricity accumulations that may be capable of initiating dusts, gases, vapors, or exposed EED. Permanent equipment in contact with conductive floors and tabletops shall not be considered grounded. Static grounds shall be bonded to the facility's grounding system. (See Chapter 7.)

C6.5. ELECTRIC SUPPLY SYSTEMS

There may be mutual hazards when PES are located near electric supply lines. To protect against these hazards, the following separation requirements apply to all new construction (PTRD and IBD specified in paragraphs C6.5.3. and C6.5.4. are based on airblast overpressure only; fragment distances do not apply):

C6.5.1. Electric lines serving explosives operating facilities shall be installed underground from a point not less than 50 ft [15.3 m] away from such facilities.

C6.5.2. Overhead electric service lines shall be no closer to combustible PES or to an open PES than the length of the electric lines between the nearest service poles and the length of the nearest service pole. An exception is when an effective means (e.g., line spacers, weights) is provided to ensure that energized lines on breaking cannot come into contact with the facility or its appurtenances.

C6.5.3. Electric distribution lines carrying less than 69 kilovolt (kV), the tower or poles supporting those lines, and unmanned electrical substations shall be no closer to PES than PTRD. (Lesser distance permitted by section C9.4. for the placement of electrical substations and transformers that support explosives areas.)

C6.5.4. Electric transmission lines carrying 69 kV or more and the tower or poles supporting them shall be located no closer to the PES than:

C6.5.4.1. IBD, if the line in question is part of a grid system serving a large off-base area.

C6.5.4.2. PTRD, if loss of the line does not create serious social or economic hardships.

C6.5.5. Electric transmission lines that can be interrupted without loss of power (i.e., power is rerouted through existing lines or networks) shall be separated from explosives sites IAW paragraph C6.5.2.

C6.6. SURGE PROTECTION FOR INCOMING CONDUCTORS

C6.6.1. An AE facility shall include surge protection for all incoming conductors. The surge protection must include suppression at the entrance to the facility from each wire to ground. All other metallic utility lines and pipes must be electrically connected to the structural steel of the building just before they enter the AE facility.

C6.6.2. Any conductors, shielded cabling, power cabling, and communication lines shall be buried underground in metal conduit for a minimum of 50 feet [15.3 m] before entering an AE facility.

C6.~~6~~*7*. HAZARDS OF ELECTROMAGNETIC RADIATION TO ORDNANCE (HERO)

Military Munitions (at times also referred to as ordnance or AE) containing Electrically Initiated Devices (EID) *(e.g., exploding foil initiators, laser initiators, burn wires, fusible links, hot bridge wires, carbon bridges, and conductive compositions)* shall be designed or protected such that Electromagnetic Radiation (EMR) does not cause their inadvertent initiation, degradation, or disablement. Both direct Radio Frequency- (RF) induced actuation of the EID or electrical coupling to and triggering of the associated firing circuits can occur, especially in a tactical radiated Electromagnetic Environment (EME). ~~Examples of EID include the following: exploding foil initiators, laser initiators, burn wires, fusible links, and EED, such as hot bridge wires, carbon bridges, and conductive compositions.~~

C6.~~6~~*7*.1. *Certification of Military Munitions*. During acquisition, HERO *evaluation* and certification shall be accomplished, both for routine employment mission profiles, and for any anticipated joint- or combined-operational employment to include ~~transshipment exposures through EME differing from the employment environment.~~ *all phases of the life-cycle EMEs identified in subparagraph C6.7.1.2.*

C6.7.1.1. Recertification of Military Munitions. HERO certification shall be accomplished when legacy military munitions are redesigned or before military munitions are employed in an EME for which they were not previously HERO certified.

C6.7.1.2. Life-Cycle EME. Minimally, HERO certification shall involve evaluation without adverse effects to military munitions in an EME relevant to all life-cycle configurations. This life cycle is referred to as the Stockpile-to-Safe-Separation sequence, or S4, and can consist of up to six distinct phases including: transportation/storage, assembly/disassembly, handling/loading, staged, platform-loaded, and immediate post-launch.

C6.7.1.3. HERO Database. All data from HERO evaluations shall be compiled in a centralized data repository to support the Joint Spectrum Center Ordnance Electromagnetic Environmental Effects (E3) Risk Assessment Database (JOERAD) for subsequent use in information applications supporting the DoD Components.

~~C6. 6.2. During subsequent phases of life cycle munitions management, additional HERO testing and certification shall be accomplished when legacy munitions are redesigned or before any employment through EME for which they where not previously HERO certified.~~

C6.7.2. EME Controls. The DoD Components shall take measures (e.g., identifying susceptibilities, quantifying electromagnetic environments, evaluating risks associated with operating procedures, and establishing tailored emission control (EMCON) instructions) to ensure that HERO effects on military munitions are resolved during the planning of joint or combined operations and training exercises.

~~C6. 67.3. Minimally, HERO certification shall involve exposure without adverse effects of the munitions to the EME relevant to all life cycle configurations, including packaging, handling, storage, transportation, checkout, loading and unloading, and launch.~~

~~C6. 67.4. All HERO test and certification data shall be compiled in a centralized data repository to support the Joint Spectrum Center Ordnance Electromagnetic Environmental Effects (E3) Risk Assessment Database (JOERAD), for subsequent use in information applications supporting Combatant Commands and the DoD Components.~~

~~C6. 67.5. The DoD Components shall take measures (e.g., identifying susceptibilities, quantifying electromagnetic environments, evaluating risks associated with operating procedures, and establishing tailored Emission Control (EMCON) instructions) to ensure that HERO effects on munitions are resolved during the planning of joint or combined operations or training exercises.~~

C6.8. POSTING OF RF WARNING SIGNS

Areas where the levels of radio-frequency electromagnetic fields constitute a radiation hazard to military munitions or to flammable materials located in areas where radiation hazards to military munitions exist shall be clearly marked with warning signs or labels for mobile emitters.

C6.8.1. HERO Warning Signs. Warning signs shall be posted at any location where radar equipment or other possible sources of EMR might create the potential for premature initiation of military munitions. Warning signs shall be placed along transportation routes approaching

military munitions operations (e.g., missile assembly, ammunition pier) at designated locations. Warning signs should alert operators of mobile or portable emitter systems to a potential hazard and restrictions when using these emitters (e.g., radios, cellular telephones) past the designated point.

C6.8.2. HERO Warning Labels. Warning labels may be affixed to all operated portable or mobile emitter systems to alert the user of the potential hazard if the emitter is operated closer than the prescribed safe separation distance for the military munitions-related operation of concern where appropriate.

C6.8.3. Radio Frequency Identification (RFID)

C6.8.3.1. Under Secretary of Defense for Acquisition, Technology, and Logistics Memorandum (Reference (m)) mandates the use of RFID technology. Reference (m) also mandates that Services quantify the mutual effects of the devices with respect to HERO.

C6.8.3.2. Prior to using electronic equipment that intentionally generates radio frequency energy to identify or track military munitions or for use within a military munitions storage or operating facility (e.g., assembly or disassembly, build-up areas), the using Service shall evaluate and certify such equipment for use. The certification process shall involve comparing the device's radiated emission characteristics with respect to a military munition's potential susceptibility and determining a safe separation distance.

C6.8.3.2.1. If the system does not have a HERO impact that requires a safe separation distance for military munitions, the Service certifying agent shall issue a HERO certification (unrestricted) to the program manager (PM), acquisition manager (AM), or installation activity (IA) and forward a copy of the certification to the Service testing agent and proponent for publications related to the affected military munition.

C6.8.3.2.2. If the system is determined to have a limited impact that will not impose operational restrictions or diminish the capability of the automatic identification technology (AIT) equipment to be used as intended, and requires a safe separation distance for military munitions, the Service Certifying Agent shall issue a HERO certification (with restrictions) to the PM, AM, or IA and forward a copy of the certification to the Service testing agent and proponent for publications related to the affected military munition.

C6.8.3.2.3. If the system can adversely affect military munitions to the extent that managing HERO will impose undue operational restrictions or the restrictions (e.g., required safe-separation distances) placed on the system will diminish the capability of the equipment to be used as intended, the Service certifying agent shall issue a letter rejecting HERO certification and notifying the PM, AM, or IA of the need to either fix the equipment or, in the case of an operational requirement, request a waiver of the HERO certification requirements. Should the PM choose to fix the AIT equipment, the HERO certification request shall be reprocessed upon evaluation by the Service testing agent.